

WHAT IS CLAIMED IS:

1. A method of removing a metal ion from a treating liquid for use in treating a substrate, comprising the steps of:

5       applying a first voltage via an electrode to the treating liquid that flows in a supply piping, so that deposition can occur; and

10       applying a second voltage higher than the first voltage to the electrode while distributing a cleaning liquid to the supply piping, so that ionization can occur.

2. The method according to Claim 1, wherein the cleaning liquid is an acid liquid having a high oxidation-reduction potential.

15       3. The method according to Claim 1, wherein the first voltage is set so as to provide an inter-electrode potential higher than 0 E/V vs. NHE.

4. The method according to Claim 2, wherein the first voltage is set so as to provide an inter-electrode potential higher than 0 E/V vs. NHE.

20       5. The method according to Claim 3, wherein the first voltage provides an electric potential lower than a standard potential of the metal to be deposited, and the second voltage provides an electric potential higher than a standard potential of the deposited metal.

25       6. The method according to Claim 4, wherein the

first voltage provides an electric potential lower than a standard potential of the metal to be deposited, and the second voltage provides an electric potential higher than a standard potential of the deposited metal.

5           7. An apparatus for treating a substrate, in which a treating liquid is supplied to the substrate to be treated and which comprises:

          a supply piping for supplying the treating liquid to the substrate;

10           first supply means for supplying the treating liquid to the supply piping;

          second supply means for supplying a cleaning liquid to the supply piping; and

          an electrode for applying a voltage to the treating  
15 liquid in the supply piping, wherein

          a first voltage is applied via the electrode to the treating liquid that is supplied from the first supply means to the supply piping, and then a second voltage higher than the first voltage is applied to the electrode  
20 while the cleaning liquid is distributed from the second supply means to the supply piping.

          8. The apparatus according to Claim 7, wherein the supply piping branches into a plurality of branch pipes in each of which the electrode is provided.

25           9. The apparatus according to Claim 7, wherein the

cleaning liquid is an acid liquid having a high oxidation-reduction potential.

10. The apparatus according to Claim 7, further comprising a treating vessel with which the supply piping  
5 is communicated and connected and in which the substrate is immersed, wherein the electrode is placed in the supply piping.

11. The apparatus according to Claim 7, wherein the treating vessel is equipped with a recovery vessel for  
10 recovering the overflowing treating liquid, and the supply piping is communicated and connected with the recovery vessel so that the recovered treating liquid is fed back to the treating vessel.

12. The apparatus according to Claim 10, wherein the  
15 treating vessel is equipped with a recovery vessel for recovering the overflowing treating liquid and a discharge pipe for discharging the recovered treating liquid from the recovery vessel.

13. The apparatus according to Claim 7, wherein the  
20 first voltage is set so as to provide an inter-electrode potential higher than 0 E/V vs. NHE.

14. The apparatus according to Claim 8, wherein the first voltage is set so as to provide an inter-electrode potential higher than 0 E/V vs. NHE.

25 15. The apparatus according to Claim 9, wherein the

first voltage is set so as to provide an inter-electrode potential higher than 0 E/V vs. NHE.

16. The apparatus according to Claim 10, wherein the first voltage is set so as to provide an inter-electrode  
5 potential higher than 0 E/V vs. NHE.

17. The apparatus according to Claim 11, wherein the first voltage is set so as to provide an inter-electrode potential higher than 0 E/V vs. NHE.

18. The apparatus according to Claim 12, wherein the  
10 first voltage is set so as to provide an inter-electrode potential higher than 0 E/V vs. NHE.

19. The apparatus according to Claim 13, wherein the first voltage provides an electric potential lower than a standard potential of the metal to be deposited, and the  
15 second voltage provides an electric potential higher than a standard potential of the deposited metal.

20. The apparatus according to Claim 14, wherein the first voltage provides an electric potential lower than a standard potential of the metal to be deposited, and the  
20 second voltage provides an electric potential higher than a standard potential of the deposited metal.